MONTHLY WEATHER REVIEW.

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The MONTHLY WEATHER REVIEW summarizes the current manuscript data received from about 3,500 land stations in the United States and about 1,250 ocean vessels; it also gives the general results of the study of daily weather maps based on telegrams or cablegrams from about 200 North American and 40 European, Asiatic, and oceanic stations.

The hearty interest shown by all observers and correspondents is gratefully recognized.

Acknowledgment is also made of the specific cooperation of the following chiefs of independent, local, or governmental services: R. F. Stupart, Esq., Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Director Meteorological Office, London; Maxwell Hall, Esq., Government Meteorologist, Kingston, Jamaica; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba; Luis G. y Carbonell, Director, Meteorological Service of Cuba, Havana, Cuba; Rev. José Algué, S. J., Director of the Weather Bureau, Manila Central Observatory, Philippines; Maj. Gen. M. A. Rykachef, Director of the Physical Central Observatory, St. Petersburg, Russia; Carl Ryder, Director, Danish Meteorological Institute, Copenhagen, Denmark.

As far as practicable the time of the seventy-fifth meridian is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

During the first two days of April a barometric depression advanced from the central valleys of the United States over the Canadian Maritime Provinces, attended by general precipitation east of the Rocky Mountains, by snow over northern districts, and by high winds on the Great Lakes and along the middle Atlantic and New England coasts. The passage of this depression over the north Atlantic Ocean was attended by whole gales. It reached Iceland on the 6th, and moved thence over European Russia during the succeeding five days. Following the depression an area of high barometer and a cold wave swept from British America to the Atlantic coast, with zero temperature in Montana on the 1st, freezing temperature to the southern line of Tennessee on the 3d, and frost in the interior of the South Atlantic States on the 4th.

The second barometric disturbance of the month appeared on the north Pacific coast on the 3d and moved rapidly eastward, attended by rain generally in the central valleys and thence to the Atlantic coast. This disturbance inaugurated over the eastern portion of the United States a period of showery weather and mild temperature that was indicated by the general pressure distribution noted under this head for the closing days of March.

The third disturbance of the month appeared over the southwestern portion of the United States on the 5th and drifted slowly eastward over the southern Plateau and Rocky Mountain districts during the succeeding two days, attended by an extensive area of precipitation. By the morning of the 8th an offshoot from this disturbance had reached Lake Huron and the rain area had advanced to the Atlantic coast. At this time a trough of low pressure extended from eastern Ontario to Texas and thence to the middle Plateau, and snow was falling from the Lake region over the Dakotas and also in Wyoming and eastern Colorado. Moving eastward from Lake Huron, with increasing strength, the storm center reached Nova Scotia the morning of the 9th. During the 9th and 10th the main depression, attended by an extensive rain area, with snow over the upper Lakes, covered the eastern half of the country, and an area of high barometer extended from the north Pacific coast over the middle and northern Rocky Mountain and Plateau regions. The center of this depression past eastward over the North Atlantic States and during the night of the 11th the barometer fell to a reported reading of 28.84 inches at Sydney, C. B. L, with strong gales on the northern coasts. The advance of the western high area was attended during the 12th and 13th by fair and cool weather over middle and eastern districts.

In the Asiatic area a rapid fall in the barometer was shown on the 7th and a decided rise in pressure had occurred over continental Europe. The American storm that reached Iceland on the 6th was deflected southeastward over western Europe and apparently reached the Black Sea, or united with a depression that appeared over southern Europe, where the barometer continued low until the 12th.

On the 13th a sharp fall in the barometer occurred over eastern Siberia, and the depression there indicated advanced over the Pacific to Bering Sea by the 15th.

From the 12th to 15th a rain area advanced from the west Gulf States to the lower Missouri and middle Mississippi valleys and thence to the Atlantic coast, the rainfall from the west Gulf districts over the lower Ohio Valley being heavy. The barometric depression that caused this rain was attended on the 15th by high winds on the Great Lakes and middle and north Atlantic coasts, and was followed by a cool wave that carried the line of freezing temperature to Pennsylvania and caused snow in the upper Lake region and the interior of New York and New England.

The southwestern depression that past eastward over the Canadian Maritime Provinces on the 15th was deflected southeastward by the high barometric area that covered Iceland and northwestern Europe, and during the 17th past near and north of the Azores, and united by the 18th with the low barometric area that appeared over southwestern Europe on the 14th.

This depression drifted slowly over the Continent of Europe, where the barometer continued low until about the close of the month. This distribution of pressure caused cold, stormy weather generally over the Continent and the British Isles, with freezing temperature and snow in the more northern countries.

In the meantime pressure had risen to 30.12 inches over the Hawaiian Islands and fallen to 29.48 inches at Nome, Alaska, by the 16th, a period of heavy rains had set in from the Gulf States over the lower Ohio Valley, and drought conditions obtained in the States of the middle Missouri, Red River of the North, and extreme upper Mississippi valleys. On Saturday the 18th the following forecast was issued for the week beginning April 19th that applied to the regions of excessive rains and continued dry weather:

For the States of the Missouri, extreme upper Mississippi, and Red River of the North valleys, where little or no rain has fallen, a season of showery weather will be inaugurated by the middle of the week. In the Gulf States and lower Mississippi Valley the excessive rains of the past week will give way to a period of more settled weather.

Heavy showers set in over the north-central districts referred to the night of Wednesday, April 22, and precipitation continued in that region during the following three or four days. In the south-central States the prolonged period of rain ended on the 21st.

Following an area of high barometer and cool weather that crost the United States from the 17th to 19th, a depression that produced unusually low barometric readings in the central valleys advanced from the Pacific coast to the Lake region, from the 20th to 26th, attended by general rains, by severe local storms in the south-central States, and by high winds over the Great Lakes and in the Middle Atlantic and New England States.

During the week ending the 25th, high barometer over Iceland and persistent low pressure over continental Europe was attended by wintry weather over the British Isles and the middle and northern countries of Europe. After the 23d the European depression apparently shifted westward over the continent and the British Isles and thence southwestward over the Atlantic, where the barometer fell to the remarkable reading of 29.26 inches at Horta, Azores, on the 29th.

During the 24th and 25th an area of high barometer of great magnitude overspread the Pacific coast States. During the succeeding days of the month this high area moved slowly southeastward attended by a cool wave that carried the line of freezing temperature to extreme northern Texas, and thence over the Ohio Valley and northern portions of the Middle Atlantic States. The cool wave was also attended by snow in the States of the Missouri Valley, and thence over the Ohio Valley and interior portions of the Middle Atlantic States, and by frost in the interior of the Gulf and South Atlantic States.

The month closed with a severe storm moving northeastward over the Atlantic seaboard, very low pressure over the Azores, and high pressure over Iceland and Siberia. The abnormal and persistent distribution of pressure shown at this time, with the barometer high in northern and low in southern latitudes, indicated a rather prolonged period of unseasonably cool weather generally over the United States.

The Denver Republican of April 27, 1908, remarks on frost warnings and fruit in that section as follows:

If the fruit crop in Colorado this year is saved it will be due largely to the fact that Mr. Brandenburg, District Forecaster of the Weather Bureau at Denver, foresaw the frost and that he and the Colorado Telephone Company sent warnings into every fruit-growing district.

Perceiving that the temperature would fall and that in all probability killing frosts would occur, 200 warning telegrams were sent to points in Utah, Wyoming, Colorado, and New Mexico, and the Colorado Telephone Company joined in the effort to put fruit growers on guard by telephoning warnings to some 8,000 ranchmen, whose homes are connected with the system.

The fact that 8,000 ranchmen in Colorado and the northern part of New Mexico have telephones, made it practicable to give the warning wide distribution. This reveals a use in the telephone both interesting in itself and creditable to the telephone company.

Warned in time, the owners of orchards were thereby given an opportunity to protect their fruit by building smudge fires at intervals in their orchards, and it seems probable that a good percentage of the crop was saved from destruction where the precaution was adopted. Unfortunately, in some localities, belief that the temperature would not fall very low prevented many of the farmers from smudging, and while the Grand Valley escaped destruction of the crop the night of Saturday, April 25, the freeze of the following night may have caused great damage in consequence of the fact that much of the material with which to build smudge fires was already consumed. In Fremont County the injury to peaches seems to be very severe; but, fortunately, a large part of the apple crop is probably safe.

Frost being caused in part by the radiation of heat, the smudge fires provide protection by checking radiation. This is done by filling the air with smoke, which constitutes an artificial cloud. This smoke cloud produces much the same effect as a natural cloud, and it is a matter of common knowledge that the danger of a killing frost is less when the sky is overcast. The merit of this expedient has been disputed, but it has proved efficacious in so many cases that fruit growers are convinced that it provides protection when the temperature falls but a little below the freezing point.

BOSTON FORECAST DISTRICT.*

[New England.]

Weather conditions were generally seasonable and snowfall was light. All warnings were displayed in good season, and there were no storms without warnings.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.*

[Louisiana, Texas, Oklahoma, and Arkansas.]

Two storm periods occurred, the first on the 23d–24th and the second on the 29–30th, when severe local storms occurred. General frost occurred over the northwestern portion of the district on the 30th. Timely warnings were issued for the frost and gales that occurred on the coast.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.*

[Kentucky and Tennessee.]

Heavy to killing frost occurred from the 2d to the 4th. The last decade of the month was marked by decided contrasts in temperature. The period 20–26th was warm, that from the 27–30th decidedly cold, with frost on the 29th and 30th, and freezing temperature over a large part of Kentucky on the latter date, with heavy wet snow over Kentucky and light snow in northwestern Tennessee.. Special warnings issued in connection with the frost and cold weather were of decided benefit.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.*

[Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Montana.]

The month was warm until the last week when low temperatures and frosts were general in nearly all sections. Because of the previous warm weather it was deemed advisable to issue frost warnings to eastern and southern portions of the district and the forecasts were verified. General navigation did not begin until after the middle of the month. Warnings were ordered for the storms that occurred during the last half and advisory messages were sent for the first half of the month, and no wrecks occurred.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.*

[Wyoming, Colorado, Utah, New Mexico, and Arizona.]

Temperature was higher than usual, except in New Mexico, the excess being notable in the northern half of the district. Precipitation was deficient in northern Utah; also in Wyoming and eastern Colorado, where the drought was becoming serious. Owing to the light snowfall in the mountains, and despite the prevailing high temperatures, the flow of the streams was small. Destructive frosts of the closing week of the month were accurately forecast and the warnings given wide distribution.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.†

[California and Nevada.]

The month was unusually dry. A drought that began early in March continued until the beginning of the third decade of April. With the exception of some showers at the close of March it was one of the longest spring dry spells experienced for many years in California. No frost nor storm warnings were issued.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.†

[Oregon, Washington, and Idaho.]

The month was warmer than usual and precipitation was deficient. Two storms of note crost the district, one on the 17th and the other on the 24th. Warnings for these storms were timely and no casualties of consequence are known to have occurred. Frosts were frequent and all important frosts were forecast sufficiently in advance for the warnings to be of benefit.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The rivers of the northern portion of the country showed, as a rule, very little departure from their usual gage readings. The breaking of a dam on the upper Missouri River, 15 miles north of Helena, Mont., caused considerable local damage and for a time threatened serious loss, but the removal of obstructions and a dam by dynamite relieved the situtation and the water subsided without serious damage, excepting the loss of two lives, one of which occurred when the dam was blown up.

During the last of March and the first of April excessive rains fell over the mountains of West Virginia and Kentucky, causing rapid and destructive rises of all the southern tributaries of the Ohio River below Parkersburg, W. Va. These, flowing into the already well-filled Ohio, caused a rapid rise of that stream, and flood stages were past at all points from Point Pleasant, W. Va., to Cairo, Ill.; the flood stage being exceeded at Cincinnati by 5.9 feet and at Cairo by 0.3 of a foot. This was the fourth and also the greatest flood this year. It also is of interest to note that, when the Ohio fell below the former flood stage of 40 feet at Cairo, Ill., on the 22d, with the exception of four days, the water had been above this mark since February 18.

Very little damage has been reported, except the loss of growing crops, owing to the timely and accurate warnings that were issued.

Heavy rains also fell over the lower portion of the Mississippi Valley, and as a result all the tributaries of the lower Mississippi River were high and several times exceeded the flood mark and overflowed the bottoms, causing some loss to live stock and to early planting, especially along the Red, Arkansas, and White rivers. These floods, combined with the heavy rains and the passage of the flood waters of the Ohio River, caused the Mississippi River to exceed flood stages thruout its length from the Ohio River to the mouth, in fact, the mean stages of the river below Memphis, Tenn., to New Orleans, La., for the month, were above the flood mark, and at several places the lowest reading for the month was above the flood line. Ample and timely warnings were issued for this high water by all the districts and very little damage has been reported. The breaking of one or two levees was reported, and by quick work the crevass was closed before much damage had occurred.

The rivers of the South Atlantic States did not exceed flood-stage mark during the month, altho some high water was reported.

The Trinity, Brazos, and Colorado rivers of Texas were all in flood, caused by the heavy rains during the last of the month, and considerable damage was done, especially along their upper portions, where the water rose higher than it has for several years.

The rivers of the Pacific coast were, as a rule, quiet, and were highest during the last days of the month.

The highest and lowest water, mean stage, and monthly range at 214 river stations are given in Table IV. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*Hermann E. Hobbs.*

* Morning forecasts made at district center; night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

CHINOOK WINDS IN EASTERN COLORADO DURING DECEMBER, 1907.

By L. H. DAINGERFIELD, Local Forecaster. Dated Pueblo, Colo., April 22, 1908.

The following text, with the accompanying daily maps and thermograms, see Charts IX and X, illustrates the chinook conditions prevailing over eastern Colorado during the closing week of December, 1907. Mountain time is used in both the text and the diagrams.

December 22.—Unusually well-developed chinook conditions prevailed over eastern Colorado during the closing week of December, 1907. During this week the pressure was relatively high almost continuously from the region where the Continental Divide crosses Colorado and New Mexico to California. A series of storms moved with great regularity from British Columbia southeastward over Montana and the Dakotas, eastward across the Lake region, and down the St. Lawrence Valley to the coast. Such was the condition on the morning of December 22, 1907, when a great indraft of air was being drawn eastward from over the mountains as is evidenced by the brisk westerly wind which prevailed at Pueblo at intervals between 1 p. m. of the 22d and 5 a. m. of the 23d, the maximum being 37 miles per hour from the west at 10:49 p. m. A glance at the accompanying thermograph trace will show a harmonious temperature response to the strong draft from over the mountains.

December 23.—The forenoon of December 23 shows a continuation of the foehn conditions of the preceding day, being augmented, as is frequently the case, by a small secondary depression over eastern Colorado. The temperature on this date exhibits remarkable variation between 1 and 9 a. m., during which time Pueblo was undoubtedly under the influence of the local depression. In Colorado the moderate precipitation on the western slope of the mountains possibly influenced the eastern slope temperature to some extent.

December 24.—A well-developed storm covered the Dakotas and eastern Montana on the morning of December 24, and the pressure remained moderately high over the Southwest and also over the California coast. Brisk to high westerly to northwesterly winds resulted at Pueblo between 10 a. m. and 6 p. m., reaching the velocity of a gale at 12:45 p. m., when a movement of 45 miles per hour from the northwest was recorded. This strong indraft from over the range of mountains was attended locally by a maximum temperature of 63° which coincided in time with that of the occurrence of the maximum wind velocity.

December 25.—A high-pressure area developed over the eastern slope by the morning of December 25 which destroyed the persistent chinook condition, but another depression had appeared over British Columbia.

December 26.—The British Columbia disturbance was central